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Research Article

Comparative Evaluation of Antioxidant and Anti-Inflammatory Activities of Water Extracts from Major Taiwanese *Mesona chinensis* Cultivars

Tzu-Huan Hung[1], Chiu-Hua Chen[2], Chia-Hua Chang[2], Ya-Lin Lee[3], Yung-Ming Yeh[4], Tsai-Li Kung[5], and Cheng Huang[6,*]

Abstract

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Mesona chinensis Benth. water extracts (MWE) have traditionally been used in Taiwan for health-promoting purposes, yet the comparative bioactivities of major cultivars remain unclear. This study examined four representative cultivars: 'Taoyuan No. 1' ('TY1'), 'Taoyuan No. 2' ('TY2'), 'TARI No. 1' ('TN1'), and 'Shuishang' ('SS'), to compare their total phenolic content (TPC), total flavonoid content (TFC), antioxidant capacity, and anti-inflammatory effects. Among them, 'TY2' exhibited the highest TPC, TFC, and antioxidant capacity, followed by 'TY1', whereas 'TN1' and 'SS' showed lower levels. All water extracts were non-cytotoxic to RAW264.7 macrophages at concentrations up to 500 μg mL^{-1} and slightly enhanced cell viability. All cultivars significantly suppressed lipopolysaccharide (LPS)-induced nitric oxide (NO) production, and the degree of inhibition roughly corresponded with their antioxidant capacity. In contrast, TNF-α and IL-6 levels were not significantly affected, and mild elevations were observed in some cultivars. Collectively, these findings demonstrate that MWE possess NO-suppressing anti-inflammatory potential. This study provides a comparative framework for identifying cultivars with superior functional characteristics and future value in functional food development.

Key words: *Mesona chinensis* water extract, Antioxidant, Nitric oxide, TNF-α, IL-6.

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* Corresponding author, e-mail: chengh@nycu.edu.tw
[1] Assistant Research Fellow, Crop Genetic Resources and Biotechnology Division, Taiwan Agricultural Research Institute, Taichung City, Taiwan, ROC.
[2] Project Assistants, Crop Genetic Resources and Biotechnology Division, Taiwan Agricultural Research Institute, Taichung City, Taiwan, ROC.
[3] Research Fellow, Crop Genetic Resources and Biotechnology Division, Taiwan Agricultural Research Institute, Taichung City, Taiwan, ROC.
[4] Assistant Research Fellow, Crop Improvement Section, Taoyuan District Agricultural Research and Extension Station. Taoyuan City, Taiwan, ROC.
[5] Research Fellow, Taoyuan District Agricultural Research and Extension Station. Taoyuan City, Taiwan, ROC.
[6] Professor, Department of Biotechnology and Laboratory Science in Medicine, National Yang Ming Chiao Tung University. Taipei City, Taiwan, ROC.

INTRODUCTION

Mesona chinensis Benth. (commonly known as grass jelly) is a traditional medicinal and edible herb of the Lamiaceae family, widely consumed in Taiwan and other Asian regions (Seah *et al*. 2024). Its characteristic cooling flavor has made it a popular summertime refreshment, but its value extends beyond its culinary appeal. Phytochemical analyses have revealed that *M. chinensis* is rich in bioactive compounds- particularly phenolic acids and flavonoids- associated with antioxidant, anti-inflammatory, hypoglycemic, and uric acid-lowering activities (Hung & Yen 2002; Lo *et al*. 2003; Chusak *et al*. 2014; Jhang *et al*. 2016). These findings provide scientific support for the plant's long-standing traditional uses and open opportunities for applications in functional foods and preventive health care.

Inflammation is a fundamental defense mechanism against infection or tissue injury (Megha *et al*. 2021). However, chronic or uncontrolled inflammation is a recognized risk factor for cardiovascular disease, diabetes, cancer, and neurodegenerative disorders (Coussens & Werb 2002; Wellen & Hotamisligil 2005; DeLegge & Smoke 2008; Pawelec *et al*. 2014). As a result, there is growing interest in natural products with anti-inflammatory potential as safer alternatives or complements to conventional therapeutics (Serrano *et al*. 2018; Merecz-Sadowska *et al*. 2020; Xie *et al*. 2024).

Several inflammatory mediators play central roles in this process. Nitric oxide (NO) contributes both to vascular regulation and to inflammatory signaling. Tumor necrosis factor-α (TNF-α) and interleukin-6 (IL-6) are key pro-inflammatory cytokines whose overproduction drives tissue damage and chronic inflammatory states (Zelová & Hošek 2013; Tanaka *et al*. 2014; Man *et al*. 2022; Russo *et al*. 2023). Extracts of *M. chinensis* have been reported to suppress these mediators in various experimental models (Huang *et al*. 2012; Huang *et al*. 2021; Huang *et al*. 2022; Seah *et al*. 2024).

Taiwan has a long history of cultivating and consuming *M. chinensis* (Hsieh *et al*. 2020), and four cultivars dominate domestic production: 'Taoyuan No. 1' ('TY1'), 'Taoyuan No. 2' ('TY2'), 'TARI No. 1' ('TN1'), and 'Shuishang' ('SS') (Hu *et al*. 2000; Hung *et al*. 2025). Despite the recognized health-promoting properties of *M. chinensis*, no systematic comparison of the antioxidant and anti-inflammatory activities of these major Taiwanese cultivars has been reported.

Water extracts were selected as the study material because previous research has shown that *M. chinensis* aqueous extracts exhibit stronger anti-inflammatory activity than ethanol extracts (Fan *et al*. 2021). Building on this rationale, we evaluated the total phenolic content (TPC), total flavonoid content (TFC), antioxidant capacity, and inhibition of inflammatory mediators (NO, TNF-α, and IL-6) of water extracts prepared from the four cultivars. By linking phytochemical profiles with bioactivity outcomes, this work provides a scientific basis for identifying cultivars with superior functional potential and supports future breeding, cultivation, and product development strategies targeting the anti-inflammatory properties of *M. chinensis*.

MATERIALS AND METHODS

Plant materials

M. chinensis cultivars 'TY1', 'TY2', 'TN1', and 'SS' were all purchased from farmers in Shuishang Township, Chiayi County, where they were cultivated in the same field (GPS: 23.418274°N, 120.430018°E). Stems and leaves were harvested together and sun-dried until the moisture content was confirmed to be below 10%. The dried materials were then stored at room temperature for six months prior to analysis. All voucher materials (Batch No.: TARI-23M1-M4) have been deposited at the Taiwan Agricultural Research Institute for future reference.

Extraction procedure

The dried *M. chinensis* material was ground using a tabletop mill (Chyun Tseh, Taichung, Taiwan) and passed through a 20-mesh sieve. The resulting powder was mixed with distilled

water at a ratio of 1:20 (w/v) and extracted using an ultrasonic extractor (ES-600N, TST, Taiwan; frequency 40 kHz, power 600 W) at 80℃ for 1 h. After extraction, the mixture was centrifuged at 14,000 g, and the supernatant was collected and lyophilized using a freeze dryer (FD-25B3P8, HCS, Taipei, Taiwan) to obtain the *M. chinensis* water extract (MWE), which was stored at -20℃ until analysis.

Total phenolic content (TPC)

TPC was determined following the Folin–Ciocalteu method (Prior *et al*. 2005). In brief, MWEs were mixed with diluted Folin-Ciocalteu reagent (109001, Merck, Darmstadt, Germany), followed by addition of sodium carbonate solution (31432, Honeywell, Offenbach am Main, Germany) for color development. Absorbance was measured at 750 nm using a microplate reader. Results were expressed as mg gallic acid equivalents per g extract (mg GAE g^{-1}) based on a gallic acid (410862500, Acros Organics, Geel, Belgium) calibration curve.

Total flavonoid content (TFC)

TFC was measured according to the method of Jing *et al*. (2015) with minor modifications. MWEs were sequentially reacted with sodium nitrite (106549, Merck, Darmstadt, Germany), aluminum chloride (0528-01, J.T.Baker, Phillipsburg, NJ, USA), and sodium hydroxide solutions. Absorbance was read at 510 nm using a microplate reader. Results were expressed as mg rutin equivalents per g extract (mg RUE g^{-1}) using a rutin (19868, Cayman, Ann Arbor, MI, USA) standard curve.

ABTS radical scavenging assay

Antioxidant activity was evaluated using the 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) radical cation ($ABTS^{\cdot+}$) scavenging assay as described by Re *et al*. (1999). Briefly, an $ABTS^{\cdot+}$ (A3219, Sigma-Aldrich, St. Louis, MO, USA) radical solution was prepared and diluted to the desired absorbance, then mixed with the MWE or water (control). Absorbance was immediately recorded at 734 nm using a microplate reader. Antioxidant capacity was quantified against a Trolox (238813, Sigma-Aldrich, St. Louis, MO, USA) standard curve and expressed as mg Trolox equivalents per g extract (mg TE g^{-1}).

Cell viability assessment (CCK-8 Assay)

Cell viability was evaluated using the Cell Counting Kit-8 (CCK-8) assay (CK04, Dojindo, Kumamoto, Japan) following the method of Tang *et al*. (2019) with minor modifications. Mouse macrophage RAW 264.7 cells (Bioresource Collection and Research Center, Hsinchu, Taiwan) were seeded into 96-well plates at a density of 1.8×10^4 cells per well. Cells were treated for 24 h with MWE. The control wells were received an equivalent volume of extraction solvent. At the end of treatment, 10 µL of CCK-8 solution was added to each well and the plates were incubated at 37℃ for 20 min. Absorbance was then measured at 450 nm using an ELISA reader. Cell viability was expressed as a percentage relative to the untreated control.

LPS-Induced inflammatory response

The procedure for inducing an inflammatory response was adapted from Tang *et al*. (2019). RAW 264.7 cells (8×10^4 cells per well) were seeded into 48-well culture plates and maintained in Dulbecco's modified Eagle medium (DMEM) (Gibco, USA) at 37℃ in a humidified incubator with 5 % CO_2. After 24 h of culture, lipopolysaccharide (LPS; 1 µg mL^{-1}; L5418, Sigma, USA) and the designated treatments were added simultaneously as follows: the experimental groups received 100 µg mL^{-1} of MWE, the positive control group received 100 µM hydrocortisone (HYD; H0888, Sigma-Aldrich, St. Louis, MO, USA), and the inflammation control group received no additional treatment. Cells without LPS stimulation served as the negative control. Culture supernatants were collected at two time points: 100 µL at 6 h post-LPS stimulation for TNF-α measurement, and another 100 µL at 24 h post-LPS stimulation for NO and IL-6 assays. All collected samples were stored at -80℃ until analysis.

Measurement of inflammatory mediators

The determination of inflammatory mediators (NO, TNF-α, and IL-6) was performed following a protocol modified from Tang *et al*. (2019). NO levels were quantified using the Griess reagent method. Briefly, 0.4 g of Griess reagent (Sigma-Aldrich, St. Louis, MO, USA) was dissolved in 10 mL of deionized water to prepare the working solution. The second aliquot of supernatant was mixed with an equal volume of Griess reagent and incubated at room temperature for 15 min, and the absorbance was read at 540 nm using an ELISA plate reader.

TNF-α levels were determined using the ELISA MAX™ Deluxe Set Mouse TNF-α kit (BioLegend, San Diego, CA, USA). The first aliquot of supernatant was diluted 1:100 and added to ELISA plates pre-coated with capture antibody, followed by incubation at room temperature for 2 h. After washing, detection antibody was added and incubated for 1 h at room temperature. The plates were washed again, substrate solution was applied, and absorbance was measured at 450 nm.

IL-6 levels were measured using the ELISA MAX™ Deluxe Set Mouse IL-6 kit (BioLegend, San Diego, CA, USA). The second aliquot of supernatant was diluted 1:100 and added to ELISA plates pre-coated with IL-6 capture antibody, followed by 2 h incubation at room temperature. After washing, detection antibody was added and incubated for 1 h. The plates were washed again, substrate solution was applied, and absorbance was measured at 450 nm using an ELISA plate reader.

Statistical analysis

All statistical analyses were performed using R (version 4.5.0; R Core Team, Vienna, Austria). Comparisons among groups were conducted using one-way analysis of variance (ANOVA), followed by Tukey's honestly significant difference (HSD) test for post hoc pairwise comparisons. Results are expressed as mean ± standard error of the mean (SEM), and a $P < 0.05$ was considered statistically significant.

RESULTS

Total phenolic and flavonoid contents of MWE

The TPC of MWE differed significantly among the four cultivars ($P < 0.001$) (Fig. 1). 'TY2' showed the highest level (132.71 ± 1.35 mg GAE g^{-1}), followed by 'TY1' (123.67 ± 2.11 mg GAE g^{-1}), 'SS' (106.76 ± 1.78 mg GAE g^{-1}), and 'TN1' (96.05 ± 2.22 mg GAE g^{-1}).

The TFC also differed significantly among the cultivars ($P < 0.001$) (Fig. 2). 'TY1' (155.14 ± 0.65 mg RUE g^{-1}) and 'TY2' (153.31 ± 1.06 mg RUE g^{-1}) were significantly higher than 'SS' (125.40 ± 0.52 mg RUE g^{-1}) and 'TN1' (125.19 ± 1.65 mg RUE g^{-1}). No significant difference was detected between 'TY1' and 'TY2', or between 'SS' and 'TN1'.

Antioxidant capacity of MWE

The antioxidant capacity of the MWE varied significantly among cultivars ($P < 0.001$) (Fig. 3). 'TY2' exhibited the highest activity (199.93 ± 1.63 mg TE g^{-1}), followed by 'TY1' (191.40 ± 1.72 mg TE g^{-1}). 'TN1' (155.70 ± 1.51 mg TE g^{-1}) and 'SS' (151.83 ± 1.86 mg TE g^{-1}) showed markedly lower values.

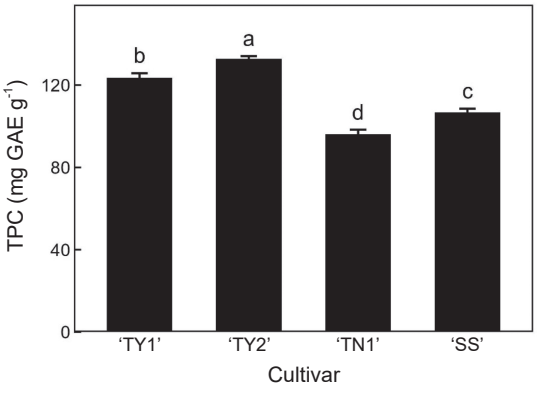

Fig. 1. Total phenolic content (TPC) of MWE from 4 cultivars. TPC was measured by the Folin-Ciocalteu method and expressed as gallic acid equivalents (mg GAE g^{-1}). 'TY1': 'Taoyuan No. 1'; 'TY2': 'Taoyuan No. 2'; 'TN1': 'TARI No. 1'; 'SS': 'Shuishang'. Data represent mean ± *SE* ($n = 3$). Different letters above bars indicate significant differences among cultivars ($P < 0.05$, Tukey's test).

Effects of MWE on RAW264.7 cell viability

Across the tested concentration range (0–500 μg mL^{-1}), MWE from all four cultivars increased RAW264.7 cell viability relative to the untreated control (Fig. 4). 'TY1' and 'TY2' displayed a clear concentration-dependent rise, with mean viability exceeding 1.2-fold of control at 500 μg mL^{-1}. 'TN1' and 'SS' showed small fluctuations at some intermediate doses, but their overall pattern likewise trended upward as extract concentration increased. No decrease below the control level was detected at any dose.

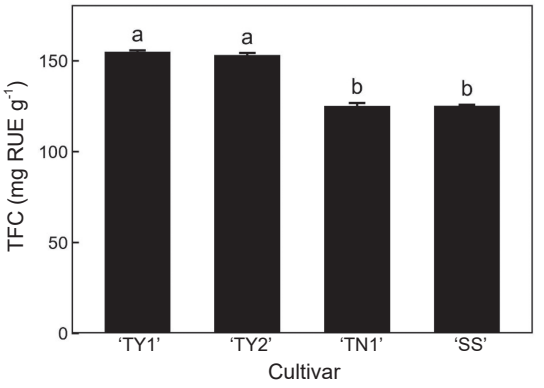

Fig. 2. Total flavonoid content (TFC) of MWE from 4 cultivars. TFC was determined by a colorimetric method based on Jing *et al*. (2015) and expressed as rutin equivalents (mg RUE g^{-1}). 'TY1': 'Taoyuan No. 1'; 'TY2': 'Taoyuan No. 2'; 'TN1': 'TARI No. 1'; 'SS': 'Shuishang'. Data represent mean ± *SE* (*n* = 3). Different letters above bars indicate significant differences among cultivars ($P < 0.05$, Tukey's test).

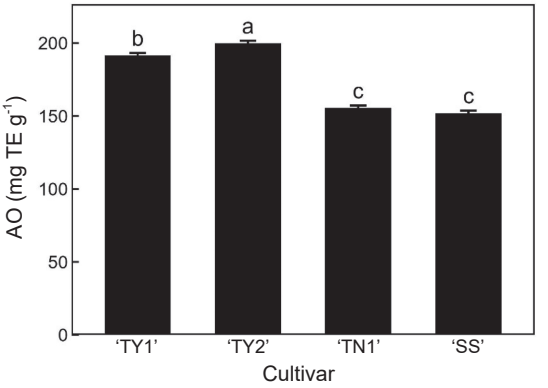

Fig. 3. Antioxidant (AO) capacity of *Mesona chinensis* water extract (MWE) from four cultivars determined by ABTS radical scavenging assay and expressed as Trolox equivalents (mg TE g^{-1}). 'TY1': 'Taoyuan No. 1'; 'TY2': 'Taoyuan No. 2'; 'TN1': 'TARI No. 1'; 'SS': 'Shuishang'. Data represent mean ± *SE* (*n* = 3). Different letters above bars indicate significant differences among cultivars ($P < 0.05$, Tukey's test).

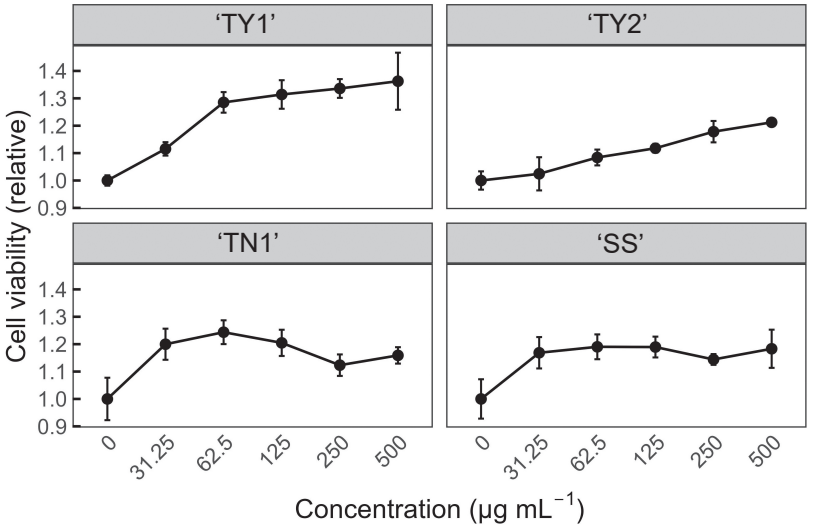

Fig. 4. Effects of *Mesona chinensis* water extract (MWE) from four cultivars ('TY1': 'Taoyuan No. 1'; 'TY2': 'Taoyuan No. 2'; 'TN1': 'TARI No. 1'; 'SS': 'Shuishang') on RAW264.7 cell viability after 24 h exposure, determined by the CCK-8 assay. Cells were treated with different concentrations of extracts (0–500 μg mL^{-1}). Data are expressed as mean ± *SD* (*n* = 4).

Effects of MWE on LPS-induced inflammatory mediators

LPS significantly increased the production in all inflammatory mediators (NO, TNF-α, and IL-6) compared with the untreated control (C group), while the positive-control HYD group effectively suppressed these inflammatory mediators ($P < 0.05$; Figs. 5–7), confirming the responsiveness of the RAW264.7 macrophage model.

MWE from the four cultivars exhibited differential inhibitory effects on LPS-induced NO production (Fig. 5). 'TY2' showed the strongest inhibition (64.5%), followed by 'TN1' (36.7%) and 'SS' (35.7%), whereas 'TY1' exerted only a mild effect (11.7%). These results indicate that NO suppression varied among cultivars, with 'TY2' being the most effective. Detailed group comparisons are provided in Fig. 5.

In contrast, MWE did not inhibit TNF-α levels compared with the LPS group (Fig. 6). 'TY2' showed a small reduction (11.8%), but this was not statistically significant. 'TY1' and 'SS' were similar to LPS. 'TN1' even significantly increased TNF-α production. These results indicate that MWE treatment did not exert an inhibitory effect on TNF-α in this model.

IL-6 production was not inhibited by MWE either (Fig. 7). 'TY1', 'TY2', and 'TN1' showed no significant change relative to LPS. In the contrast, 'SS' significantly enhanced IL-6 levels. Overall, MWE had no inhibitory effect on IL-6 production, with 'SS' even increasing its levels.

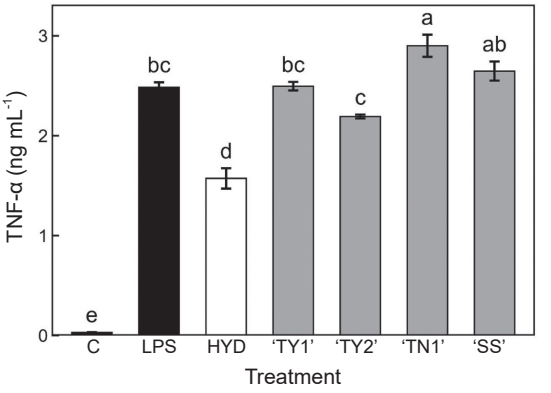

Fig. 6. Effects of *Mesona chinensis* water extract (MWE) from 4 cultivars on LPS-induced TNF-α production in RAW264.7 cells. C: control group, LPS: LPS-treated group, HYD: hydrocortisone-treated positive control; 'TY1': 'Taoyuan No. 1'; 'TY2': 'Taoyuan No. 2'; 'TN1': 'TARI No. 1'; 'SS': 'Shuishang'. Data represent mean ± *SE* (n = 3). Different letters above bars indicate significant differences among groups ($P < 0.05$, Tukey's test).

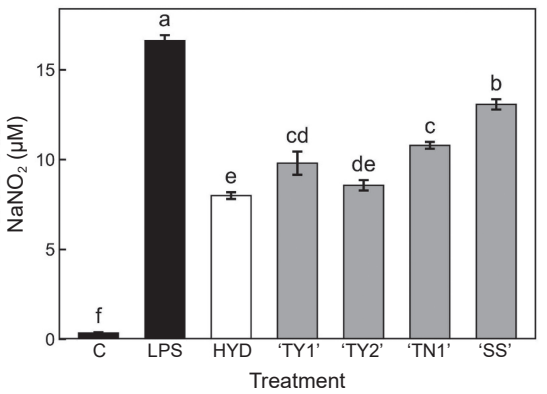

Fig. 5. Effects of *Mesona chinensis* water extract (MWE) from 4 cultivars on LPS-induced NO production in RAW264.7 cells. C: control group; LPS: LPS-treated group; HYD: hydrocortisone-treated positive control; 'TY1': 'Taoyuan No. 1'; 'TY2': 'Taoyuan No. 2'; 'TN1': 'TARI No. 1'; 'SS': 'Shuishang'. Data represent mean ± *SE* (n = 3). Different letters above bars indicate significant differences among groups ($P < 0.05$, Tukey's test).

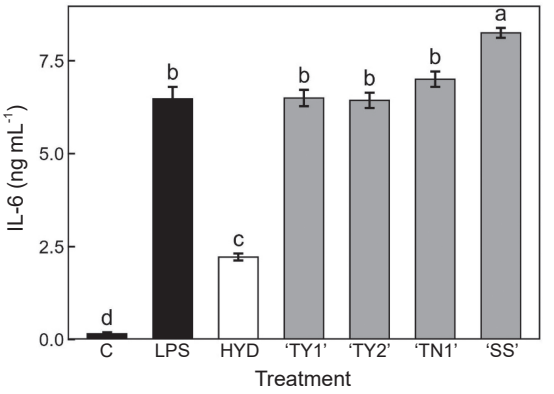

Fig. 7. Effects of *Mesona chinensis* water extract (MWE) from 4 cultivars on LPS-induced IL-6 production in RAW264.7 cells. C: control group, LPS: LPS-treated group, HYD: hydrocortisone-treated positive control; 'TY1': 'Taoyuan No. 1'; 'TY2': 'Taoyuan No. 2'; 'TN1': 'TARI No. 1'; 'SS': 'Shuishang'. Data represent mean ± *SE* (n = 3). Different letters above bars indicate significant differences among groups ($P < 0.05$, Tukey's test).

DISCUSSION

Antioxidant profile of MWE

Previous studies have shown that MWE possess strong antioxidant capacity, largely attributed to phenolic acids and flavonoids (Hung & Yen 2002). However, no study has systematically compared the TPC, TFC, and antioxidant capacity among the four major Taiwanese cultivars. The present work addresses this gap.

Our results reveal marked cultivar-dependent differences in TPC, TFC, and antioxidant capacity. In general, antioxidant capacity was positively associated with both TPC and TFC. 'TY2' showed the highest antioxidant activity, followed by 'TY1', whereas 'TN1'and 'SS' exhibited lower levels of both phenolics and antioxidant potential. Nevertheless, this correlation was not strictly linear, implying that qualitative variation in phenolic composition may also contribute to antioxidant performance.

Interestingly, a study using 50% ethanol extraction reported that 'SS' and 'TN1'contained the highest levels of rosmarinic acid, a strong antioxidant, among the four cultivars (Hung *et al*. 2025), whereas the present water extract results showed relatively low antioxidant activity in these same cultivars. This discrepancy highlights the solvent-dependent recovery of bioactive constituents. Water extraction is generally less efficient than hydroalcoholic solvents for moderately polar compounds such as rosmarinic acid and flavonoid glycosides (Ziani *et al*. 2023). Consequently, the antioxidant activity of water extracts may instead arise mainly from more hydrophilic phenolic acids, such as caffeic, protocatechuic, vanillic, and syringic acids (Hung & Yen, 2002; Xiao *et al*. 2022), along with polysaccharides that have been reported to possess radical-scavenging activity (Lin *et al*. 2017).

Further studies should quantify these hydrophilic components to clarify their relative contributions to the overall antioxidant potential of *M. chinensis* cultivars. Although the present work focused on total phenolic and flavonoid contents, further chromatographic profiling using high-performance liquid chromatography (HPLC) or liquid chromatography-mass spectrometry (LC-MS) of individual compounds will be necessary to better elucidate the chemical determinants of cultivar-specific antioxidant and anti-inflammatory activities.

Cytotoxicity assessment and NO suppression of MWE

CCK-8 assays confirmed that MWE from all four cultivars were not cytotoxic to RAW264.7 macrophages at concentrations up to 500 μg mL^{-1}. A slight increase in cell viability was even observed across all extracts, suggesting that these water extracts are biologically safe for immune cells (Fig. 4). The LPS challenge successfully induced NO, TNF-α, and IL-6 production, while HYD effectively suppressed these responses, validating the reliability of the RAW264.7 model and confirming that our positive control functioned as expected (Figs. 5–7).

Suppression of NO is a recognized indicator of anti-inflammatory potential. All *M. chinensis* cultivars significantly reduced LPS-induced NO production (Fig. 5). The strength of this inhibition seemed to track with the extracts' antioxidant capacity. For example, 'TY2' had the highest antioxidant activity, and also produced the strongest NO suppression. In the contrast, 'TN1' and 'SS' with weaker antioxidant activity showed correspondingly weaker NO inhibition. These findings are consistent with the view that the antioxidant capacity of natural extracts is associated with the ability of NO suppression (Abas *et al*. 2006; Bor *et al*. 2006).

Mechanistically, the observed NO suppression by MWE may result from downregulation of inducible nitric oxide synthase (iNOS) or modulation of upstream signaling pathways such as MAPK–NF-κB. Supporting evidence comes from prior studies in which aqueous *M. chinensis* extracts lowered iNOS expression in carrageenan-induced models (Huang *et al*. 2012). In addition, triterpenes and sesquiterpenes isolated from *M. chinensis* methanolic extracts potently inhibited

LPS-induced NO production in RAW264.7 cells, concomitantly reducing iNOS protein levels through MAPK–NF-κB pathway interference (Huang *et al*. 2021; Huang *et al*. 2022). Future work should examine whether cultivar-to-cultivar differences in NO suppression are associated with variations in iNOS/MAPK–NF-κB signaling. Moreover, because our data showed a positive correlation between antioxidant capacity and NO suppression, identifying the specific antioxidant compounds responsible will be crucial for assessing anti-inflammatory potential of *M. chinensis*.

Complexity in TNF-α and IL-6 modulation of MWE

TNF-α and IL-6 are key pro-inflammatory cytokines governed by NF-κB, and their sustained production amplifies inflammatory responses. Under our water-extraction conditions, MWE did not significantly suppress TNF-α or IL-6 production in RAW264.7 cells (Figs. 6–7). Instead, specific cultivars triggered pro-inflammatory cytokines: 'TN1' increased TNF-α and 'SS' elevated IL-6. Similar patterns have been reported for some natural extracts such as ethanol extract of *Andrographis paniculata* (Burm. f.) Wall. ex Nees and hexane extract of *Taxillus chinensis* Chiu, with strong inhibition of NO but little or no effect on TNF-α or IL-6 (Chao *et al*. 2007).

Many reports of reduced TNF-α and IL-6 levels after *M. chinensis* treatment involve organic-solvent extracts or isolated terpenes (Huang *et al*. 2021; Huang *et al*. 2022). In addition, phenolic acids abundant in *M. chinensis* such as rosmarinic acid and caffeic acid have been demonstrated to directly down-regulate pro-inflammatory mediators (Qiao *et al*. 2005; Migliori *et al*. 2015). By contrast, polysaccharide-rich water extracts have frequently (though not always) been reported to increase TNF-α and IL-6 secretion in macrophages. For example, *M. chinensis* polysaccharides were shown to raise IL-6, IL-1β, and TNF-α in macrophages (Huang *et al*. 2020), and sulfated *M. chinensis* polysaccharide enhanced RAW264.7 viability together with IL-6, IL-1β, and TNF-α secretion (Shen *et al*. 2021). Collectively, these findings indicate that crude water extracts may contain chemical classes with opposing biological effects. The immunostimulatory fraction likely includes crude polysaccharides, which account for about 7% of the dry sample (Lin *et al*. 2017). In contrast, phenolic acids and triterpenes are recognized for their anti-inflammatory activity. Therefore, the net anti-inflammatory activity of each cultivar will reflect the balance between these chemical groups and depend on both cultivar genetics and extraction parameters.

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臺灣主要仙草品種水萃物之抗氧化與抗發炎活性比較

洪子桓[1] 陳秋樺[2] 張家華[2] 李雅琳[3] 葉永銘[4] 龔財立[5] 黃琤[6,*]

摘要

洪子桓、陳秋樺、張家華、李雅琳、葉永銘、龔財立、黃琤。2026。臺灣主要仙草品種水萃物之抗氧化與抗發炎活性比較。台灣農業研究 75(1):147–157。

仙草 (*Mesona chinensis* Benth.) 水萃物傳統上具有保健功效，但針對臺灣主要品種的抗氧化與抗發炎活性尚缺乏系統性比較。本研究評估 4 個仙草品種：「桃園 1 號」(‘TY1’)、「桃園 2 號」(‘TY2’)、「農試 1 號」(‘TN1’) 及「水上種」(‘SS’) 的總酚含量 (total phenolic content; TPC)、總黃酮含量 (total flavonoid content; TFC)、抗氧化能力以及抗發炎活性。結果顯示，‘TY2’ 的 TPC、TFC 及抗氧化力最高，其次為 ‘TY1’，而 ‘TN1’ 與 ‘SS’ 較低。所有水萃物在 RAW264.7 巨噬細胞中於 500 μg mL^{-1} 以下均無細胞毒性，甚至略微提升細胞活性。所有品種均顯著抑制脂多醣誘導的一氧化氮生成，且抑制強度大致與抗氧化力相關。相比之下，腫瘤壞死因子 α 與介白素 -6 生成並未被仙草水萃物明顯抑制，部分品種 (‘TN1’ 與 ‘SS’) 甚至促進其分泌。整體而言，仙草水萃物具有抑制一氧化氮的抗發炎活性。本研究為篩選具最佳抗氧化及抗發炎潛力的仙草品種提供了比較框架。

關鍵詞：仙草水萃物、抗氧化、一氧化氮、腫瘤壞死因子 α、介白素 -6。

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* 通訊作者：chengh@nycu.edu.tw
[1] 農業部農業試驗所遺傳資源及生物技術組助理研究員。臺灣 臺中市。
[2] 農業部農業試驗所遺傳資源及生物技術組計畫助理。臺灣 臺中市。
[3] 農業部農業試驗所遺傳資源及生物技術組研究員。臺灣 臺中市。
[4] 農業部桃園區農業改良場作物改良科助理研究員。臺灣 桃園市。
[5] 農業部桃園區農業改良場研究員。臺灣 桃園市。
[6] 國立陽明交通大學醫學生物技術暨檢驗學系教授。臺灣 臺北市。